CLAIMS:

1. Method for supervising an OFDM wireless communication system including a MAC layer and a PHY layer, said PHY layer including a supervisor unit, wherein:

a) a first set of input data comprising a Target_Rate and a Target_BER is inputted into the supervisor unit; and

b) the first set of input data is processed by the supervisor unit; and

c) a code rate C and a set of codes $M = \{M_i\}$ for specifying constellations for sub-channels are outputted from the supervisor unit.

2. The method of Claim 1 for minimizing transmission power in the OFDM wireless communication system, said PHY layer including the supervisor unit controlling performance of the PHY layer, wherein:

a) processing of first and second sets of input data for minimizing transmission power in a wireless communication network system comprises:

b) calculating the maximum bit rate achievable by every couple M/C, identified by modulation k and code-rate *i*, with all sub-channels turned on;

c) eliminating the couples M/C for which the maximum achievable bit rate is less than the requested one;

d) for every couple useful M/C:

d1) calculating the minimum number of sub-channels required to achieve the bit rate B;

d2) deriving, from simulation-based curves, the SNR necessary to obtain the required BER in the AWGN case and use it to derive the SNR required by the worst sub-channel;

e) calculating the total received power for all $N^{(k,i)}$ sub-channels;

f) selecting and outputting an "optimum" couple M/C ($(M,C)_{min\_pow}$)which minimizes $P_r^{(k,i)}$: $P_{r,\min\_pow} = \min_{(k,i)}\left\{P_{r,tot}^{(k,i)}\right\}$

3. The method of Claim 2, wherein, in case the starting information is the maximum transmit power and the Target_BER, the processing of the first and second set of

input data for minimizing transmission power in a wireless communication network system comprises:

a) calculating the maximum received power;

b) calculating the minimum SNR on the weakest sub-channel, for every number j of sub-channels considered and storing the result;

c) for every couple M/C, calculating the number of sub-channels having an SNR above the threshold yielding the BER requested by the MAC sub-layer;

d) calculating the bit rate achievable using $N^{(k,i)}$ sub-channels;

e) finding the M/C (called $(M,C)_{max}$) that yields the maximum bit rat; and

f) selecting and outputting an "optimum" couple M/C (called $(M,C)_{max}$).

4. The method of Claim 2, wherein, in case the starting information is the maximum transmit power and the Target_Rate, the processing of the first and second set of input data for minimizing transmission power in a wireless communication network system comprises:

a) calculating the maximum receive power;

b) for every M/C, calculating the number of sub-channels used to achieve the bit rate Target_Rate;

c) selecting the SNR on the worst sub-channel;

d) calculated from the BER-SNR curve the BER corresponding to the worst sub-channel for modulation of k and code-rate i;

e) finding the M/C (called $(M,C)_{min}$) that yields the minimum value; and

f) selecting and outputting an "optimum" couple M/C (called $(M,C)_{min}$).

5. The method of Claim 1 for minimizing processing power in an OFDM wireless communication system including a MAC layer and a PHY layer, said PHY layer including a supervisor unit controlling performance of the PHY layer, wherein:

a) processing of first and second sets of input data comprises:

b) comparing Target_Rate and Rate_(N) = C_*log(M_)*N for each available N (from 1 to max_available_N);

c) selecting and accepting the values of N satisfying Target_Rate ≤ Rate_(N);

d) ordering these values in ascending order to get $[N_{min}, N_{max}]$;

e) assuming $N_{opt} = N_{min}$; and

f) providing N_{opt} and minimum TX power parameters as output.

6. The method of Claim 5, further comprising, after assuming $N_{opt} = N_{min}$,:

checking if the transmission power constraint is satisfied, if so providing N_{opt} and minimum TX power parameters as output, if not

proceeding to check if another value is available in the set $[N_{min}, N_{max}]$, if so, choosing the next (next_N), setting N to next_N and jumping to select and accept the values of N that satisfy Target_Rate ≤ Rate_(N), if not

setting $N_{opt} = 0$ and providing N_{opt} and minimum TX power parameters as output.

7. The method of Claim 6, wherein the processing of the first and second set of input data for minimizing transmission power in a wireless communication network system comprises:

selecting the best window position among the possible ones:

(max_available N-(N_{opt} -1)); and

running the adopted TX power minimization algorithm on the selected window.

8. The method of Claim 1, 2 or 5, comprising

feeding the first set of input data as to the QoS requirements at the PHY layer from the MAC layer to the supervisor unit;

feeding a second set of input data including channel power transfer functions $H = \{|H_i|^2\}$: (index i refers to the i^{th} sub-carrier) from PHY layer to the supervisor unit;

processing the first and second set of input data for minimizing processing and transmission power in a wireless communication system;

outputting N, modulation, coding parameters and transmission power parameters to the PHY layer.

9. The method of Claim 8, wherein the feeding of the first set of input data as to the QoS requirements at the PHY layer from the MAC layer to the supervisor unit comprises feeding a Max_Delay (max tolerable delay).

10. The method of Claim 8, wherein the outputting of coding parameters and transmission power parameters to the PHY layer comprises:

N: IFFT/FFT length;

the C: Code rate data;

B: Block length data;

n: data as to the number of decoding iterations;

the $M = \{M_i\}$: data as to a set of codes to specify the generally different constellations adopted for the different sub-channels (e.g. M_i=0 means that the i^{th} sub-channel is OFF, different values specify constellation types in the pre-defined available set); and

$P = \{P_i\}$: data as to a set of the generally different transmission powers adopted for the different sub-channels (e.g. P_i=0 means that the i^{th} sub-channel is OFF).

11. The method of Claim 8, comprising outputting actual QoS data to the MAC layer.

12. The method of Claim 1, 2, 5 or 11, wherein outputting of actual QoS data to the MAC layer comprises outputting:

an Actual_Rate (rate actually determined for the current transmission); and

an Actual_BER (BER actually determined for the current transmission).

13. The method of Claim 11 or 12, wherein the MAC layer requests a feedback specifying a Feedback_mode [0/1] (one bit information to specify if MAC is interested to have feedback information on the "current" maximum available rate or the minimum available BER), and, furthermore, specifies a Service_mode [0/1] (one bit information to specify if MAC QoS requirements refers to a Rate guaranteed service or to a BER guaranteed service).

14. The method of any of the Claims 11 to 13, wherein the outputting of actual QoS data to the MAC layer additionally comprises, depending on the Feedback_mode request from MAC layer, outputting:

a MAC_return comprising a Max_available_Rate (maximum available rate for the current channel condition as far as BER and tolerable delay requirements are concerned) or

a Min_available_BER (minimum available BER for the current channel condition as far as rate and tolerable delay requirements are concerned) is provided after the optimization processing.

15. The method of claim 1, 2, 5 or 11, wherein the processing of the first and second set of input data for minimizing processing and transmission power in a wireless communication network system comprises finding N, the M/C couple and the ON sub-channels required to fit the Target_Rate and the Target_BER requirements with the minimum power, given the current channel condition.

16. The method of claim 15, wherein, in case the channel conditions prevent achieving the required QoS even with the maximum available transmission power the supervisor algorithm (depending on Service_mode) finds the M/C couple, the number and the position of the ON sub-channels required to get

the Maximum Rate compatible with the Target_BER requirement, given the current channel condition and the maximum power allowed by the system specifications, or

the Minimum BER compatible with the Target_Rate requirement, given the current channel condition and the maximum power allowed by the system specifications.

17. An OFDM wireless communication system including a MAC layer and a PHY layer, said PHY layer including a supervisor unit, wherein the supervisor unit is configured to perform any of the methods of Claims 1 to 16.

18. A supervisor unit in an OFDM wireless communication network system including a MAC layer and a PHY layer including said supervisor unit, wherein the supervisor unit is configured to perform any of the methods of Claims 1 to 16.

19. An interface unit in an OFDM wireless communication system including a MAC layer and a PHY layer, said PHY layer including a supervisor unit, said interface being located between the supervisor unit and the MAC layer, wherein said interface unit is configured to perform any of the methods of Claims 1 to 16.

20. A computer-readable medium containing a computer-readable program for use in an OFDM wireless communication system including a MAC layer and a PHY layer, said PHY layer including a supervisor unit, wherein the program, when implemented in the supervisor and run in the supervisor unit, causes the supervisor to perform the method of any of the Claims 1 to 16.